
ON-LINE PARALLEL GAS CHROMATOGRAPHY FOR HIGH-THROUGHPUT SECONDARY SCREENING OF HETEROGENEOUS CATALYSTS

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Rapid analysis, detailed and accurate speciation, and automated operation are the primary requirements of an analytical system for high-throughput (HT) secondary screening of heterogeneous catalysts. On-line parallel gas chromatography (GC) meets these requirements by offering continuous, robust, fast analysis of complex gas streams, typically consisting of compounds from several classifications and covering a wide range of boiling points. Using a parallel chromatographic approach, a difficult and lengthy separation can be divided into several short and simple separations, thereby decreasing the total analysis time without compromising the accuracy of measurement and improving the robustness.

For demonstration, the on-line parallel chromatography system designed for analysis of propane oxidative dehydrogenation reaction streams from a 48-channel heterogeneous catalyst reactor will be presented. The analytical system used for catalyst screening consisted of three on-line Maxum process gas chromatographs equipped with six identical methods in total. Each method contained two parallel separation trains that used backflush and column switching techniques to obtain the required separations within 460 seconds. Interface of the gas chromatographs (GCs) to the reactor system was achieved via a flexible sample system which allowed two reaction streams to be delivered to each of the three GCs for simultaneous analysis. This yielded an overall sampling frequency of one hour per catalyst in a 48-channel screen. Sampling, analysis, reporting and archiving of screening results was fully automated and controlled by the reactor's control system.